

**STORM ANALYSIS ADDENDUM TO SDAP 18-02605**

**FOR:**

**SEASIDE AT KINGSTON**  
**S.D.A.P.**

**CLIENT:**

**ELEMENT RESIDENTIAL INC.**  
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**(425) 949-8041**

**BY:**

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**JOB NO. 9946-17**



**DECEMBER 2020**

**SEASIDE AT KINGSTON SDAP**  
**ADDENDUM TO SDAP 18-02605**

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**FIGURE 1 – SEASIDE STORM DROP PLAN, PROFILE AND DETAIL**

## **I. INTRODUCTION:**

Seaside Kingston LLC proposed a residential development of approximately 6.6 acres on an approximately 7.08 acre site. The project SDAP (SDAP 18-02605) was approved in April of 2019. Site construction has been mostly completed and the Final Plat documents have been submitted. A subsequent Memo from Kitsap County Roads/Engineering dated May 18, 2020 stated concerns with the approximately 10 ft freefall connection from the existing 15" diameter storm system in Lindvog Road ROW to the new CB #42 which facilitates the connection of the Seaside project storm system. Also discussed in the Memo is the conveyance capacity of the revised system.

This addendum analyzes a revision to the approved plans that includes removal of the 10' drop into CB #42 and instead conveying runoff directly to the bottom of the CB, which also improves the conveyance capacity by preserving the velocity of the stormwater. No changes are proposed to the storm mitigation or conveyance within Seaside for this addendum.

## **II. PROPOSED STORM SYSTEM REVISION:**

The proposed stormwater improvements on site are unchanged from the approved report. The only revision proposed with this addendum is the entrance to CB #42, which is currently proposed to be an outside drop connection, as well as channeling the bottom of CB #42. This addendum analyzes the impact of these improvements, as well as backwater into the storm system for the site itself.

## **III. UPSTREAM ANALYSIS:**

The 100-yr upstream flow for the Lindvog ROW storm system is 8 cfs, per the Kitsap County Memo, and will be used for analysis in this addendum. Other aspects of upstream runoff are unchanged from the approved report.

## **IV. DOWNSTREAM ANALYSIS:**

The mitigated stormwater from the site discharges to the existing stormwater system along Lindvog Road via the proposed improvements. The Lindvog system thence discharges to an existing detention pond. As a part of this addendum, a backwater analysis is conducted on the storm conveyance downstream of the site given the most recent proposed improvements to analyze the affects on the site storm system.

## V. DESIGN CALCULATIONS:

### A. PARAMETERS:

1. Stormwater Runoff:  
For simplicity, constant flow Hydrographs are created in Stormshed for the backwater analysis based on peak flows. This is considered conservative, as it assumes the peak flows for site and upstream occur at the same time, which is probably not the case given the detention system for Seaside would tend to delay peak flow from that basin.
2. Water Quality Mitigation:  
Unchanged from approved report.
3. Technical requirements:  
Unchanged from approved report.
4. Computer Software Used:  
Computer software used is StormShed Software for hydrology (Version 6.1.6.6) by Engenious Systems, Inc.
5. Rainfall Precipitation:  
N/A, since 100-yr flows are known and constant flow hydrographs are created and used.
6. Area delineation for Basins:  
 $A_{ex}$  = Existing Area  
 $A_{dev}$  = Developed Area
7. Time of Concentration ( $T_c$ ):  
Not used, since constant flow hydrographs are used.

### B. STORMWATER FACILITY DESIGN:

#### 1. Conveyance Backwater Analysis:

Hydrographs for the analysis are generated by adding a fixed amount of flow to a generated hydrograph, providing a constant flow to evaluate the effects on the conveyance system.

The storm system is modeled in Stormshed from the upstream existing CB to beyond CB #43 at the connection to the existing system, and to the next existing CB on the east side of Lindvog Rd that is influenced by the detention pond.

The upstream hydrograph of 8.0 cfs is introduced at the north end (or left side) of the model into the existing CB, and 0.41 cfs hydrograph is introduced into CB 41 at the west side (or bottom) of the model, just prior to entering CB #42. Tail water is introduced at the south end (right side) of

the model to simulate the possible effects of the existing Lindvog detention system. Tail water is checked at the maximum assumed level (at the top of the downstream catch basin) of 57.13 ft, and a relatively low (3 ft lower) level of 54.13, or 0.6' above the invert. As with peak flows, tailwater assumptions also assume that the peak detention tailwater will occur at the same time as peak flows, which is a conservative assumption based on the constant flow hydrographs, and is a situation that would be very rare in real life.

**Results:**

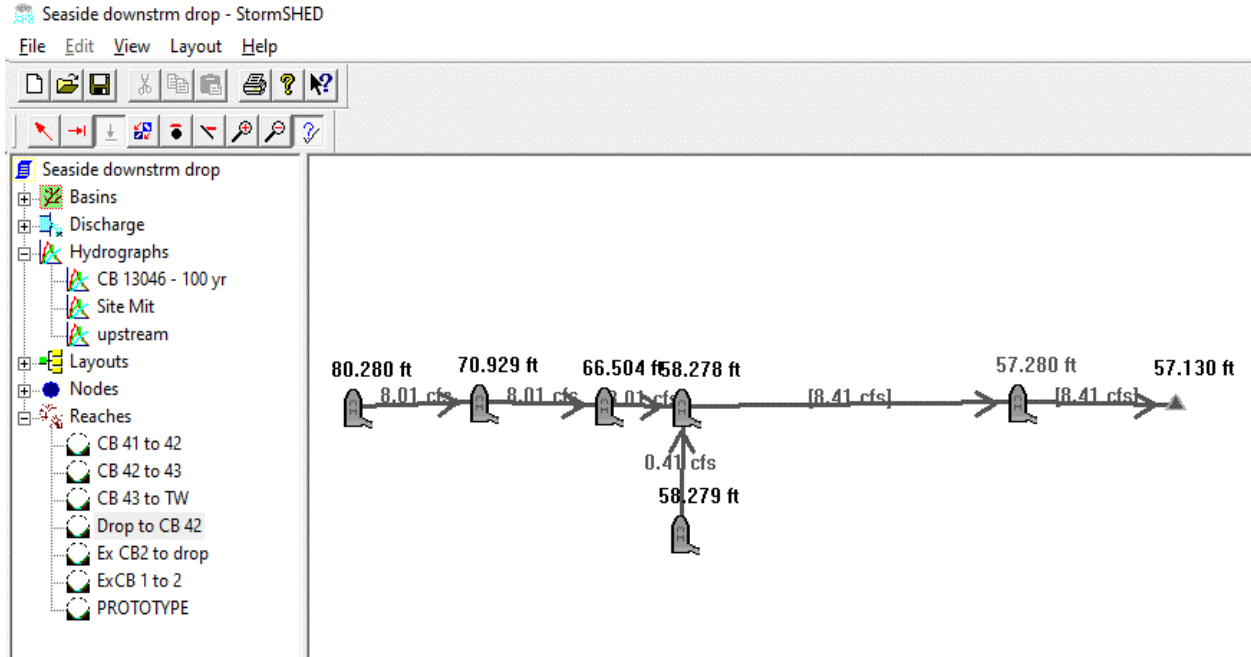
Based on maximum tailwater, there is overtopping of the grate of CB #43, and CB #42 backs up to elevation 58.28. The outlet of the detention barrels is at elevation 57.50, therefore the influence on the detention system is only 0.78 ft of depth within the tank with a working depth of 9.3 feet and only within a 311 ft segment of 10 ft diameter detention barrel. This results in approximately 2,200 cf of storage out of a total storage of 73,750 cf - thus only 3% of the entire detention volume. On this basis, the influence of the backwater is considered negligible for the on-site Seaside Development storm system.

Using lower tail water at elevation 54.13, CB #43 backs up to 1 ft below the grate, and the backup at CB #42 is at 57.16, which is low enough to have no influence on the Seaside detention system.

Thus, it is clear that the tail water in the existing detention system is largely responsible for the backwater in the conveyance system. Any backwater absorbed by the Seaside detention system can only help the situation. It is also evident by looking at the data that by correcting the issue of the uncontrolled drop, the barrel velocity is used to help the conveyance situation, and thus the proposed addition of an outside drop with channeling of CB #42 preserved the barrel velocity into the downstream and reduces problems at CB #42.

## 2. Design Data:

### Results with High Tail Water at 57.13

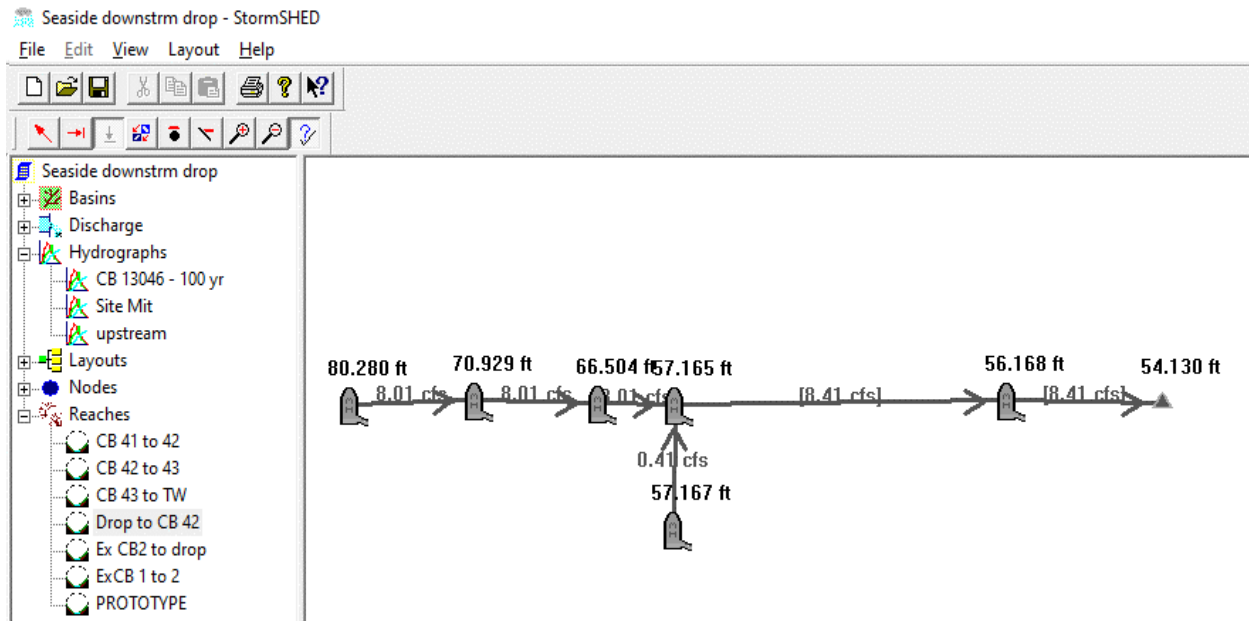


#### ROUTEHYD [ ] THRU [Layout 1] USING TYPE1A AND [100 yr] NOTZERO RELATIVE

Reach	Area ac	Flow cfs	Full Q cfs	% Full ratio	nDepth ft	Size	nVel ft/s	fVel ft/s	CBasin / Hyd
ExCB 1 to 2	0.1000	8.0059	15.6715	0.51	0.6330	15" Diam	12.8390	12.7703	upstream
Ex CB2 to drop	0.1000	8.0059	15.5009	0.52	0.6371	15" Diam	12.7339	12.6313	
Drop to CB 42	0.1000	8.0059	69.8177	0.11	0.2858	15" Diam	37.8641	56.8926	
CB 41 to 42	0.1000	0.4059	17.6030	0.02	0.1573	18" Diam	4.1163	9.9613	Site Mit
CB 42 to 43	0.2000	8.4117	8.0683	1.04	1.2963	18" Diam	5.1818	4.5657	
CB 43 to TW	0.2000	8.4117	7.0169	1.20	-1.0000	15" Diam	1.1988	5.7179	

From Node	To Node	Rch Loss ft	App Head ft	Bend Loss ft	Junct Loss ft	HW Elev ft	Max EI/ Rim EI ft
	CB 13046					57.1300	
CB 43	CB 13046	58.8565	0.3518	0.0030	-----	57.2800	57.1800
CB 42	CB 43	58.9053	0.6609	0.0057	0.0276	58.2778	68.6700
Drop	CB 42	67.1626	0.6609	0.0024	-----	66.5041	68.6700
Ex CB2	Drop	71.5811	0.6609	0.0090	-----	70.9293	73.3800
Ex CB1	Ex CB2	80.2802	-----	-----	-----	80.2802	81.9500
CB 41	CB 42	58.2793	-----	-----	-----	58.2793	69.7500

## Results with Low Tail Water at 54.13



### ROUTEHYD [ ] THRU [Layout 1] USING TYPE1A AND [100 yr] NOTZERO RELATIVE

Reach	Area ac	Flow cfs	Full Q cfs	% Full ratio	nDepth ft	Size	nVel ft/s	fVel ft/s	CBasin / Hyd
ExCB 1 to 2	0.1000	8.0059	15.6715	0.51	0.6330	15" Diam	12.8390	12.7703	upstream
Ex CB2 to drop	0.1000	8.0059	15.5009	0.52	0.6371	15" Diam	12.7339	12.6313	
Drop to CB 42	0.1000	8.0059	69.8177	0.11	0.2858	15" Diam	37.8641	56.8926	
CB 41 to 42	0.1000	0.4059	17.6030	0.02	0.1573	18" Diam	4.1163	9.9613	Site Mit
CB 42 to 43	0.2000	8.4117	8.0683	1.04	1.2963	18" Diam	5.1818	4.5657	
CB 43 to TW	0.2000	8.4117	7.0169	1.20	-1.0000	15" Diam	1.1988	5.7179	

From Node	To Node	Rch Loss ft	App Head ft	Bend Loss ft	Junct Loss ft	HW Elev ft	Max El/ Rim El ft
CB 43	CB 13046	56.5165	0.3518	0.0030	-----	54.1300	57.1800
CB 42	CB 43	57.7930	0.6609	0.0057	0.0276	56.1677	68.6700
Drop	CB 42	67.1626	0.6609	0.0024	-----	57.1655	68.6700
Ex CB2	Drop	71.5811	0.6609	0.0090	-----	66.5041	73.3800
Ex CB1	Ex CB2	80.2802	-----	-----	-----	70.9293	81.9500
CB 41	CB 42	57.1670	-----	-----	-----	80.2802	69.7500

## Hydrographs

### Hydrograph ID: upstream

Area:	0.1000 ac	Hyd Int:	10.00 min	Base Flow:	8.0000 cfs
Peak Flow:	8.0059 cfs	Peak Time:	8.17 hrs	Hyd Vol:	11.6299 acft

### Hydrograph ID: Site Mit

Area:	0.1000 ac	Hyd Int:	10.00 min	Base Flow:	0.4000 cfs
Peak Flow:	0.4059 cfs	Peak Time:	8.17 hrs	Hyd Vol:	0.5858 acft

## Nodes

### Node ID: Ex CB1

Desc:	Manhole structure		
Start El:	77.7800 ft	Max El:	81.9500 ft
Contrib Basin:		Contrib Hyd:	upstream
Hgl Elev:	80.2802 ft		
Struct Type:	CB-TYPE 1	Classification	Catch Basin
Ke Descrip:	CMP: Headwall or Headwall & Wingwall sq edge;.ke=0.5		
Catch Depth:	1.4160 ft	Bot Area:	3.9700 sf
Condition:	No particular shape.	Status:	Existing Structure
Approach Credit:	0.0000 ft		

### Node ID: Ex CB2

Desc:	Manhole structure		
Start El:	69.4000 ft	Max El:	73.3800 ft
Contrib Basin:		Contrib Hyd:	
Hgl Elev:	70.9293 ft		
Struct Type:	CB-TYPE 1	Classification	Catch Basin
Ke Descrip:	CMP: Headwall or Headwall & Wingwall sq edge;.ke=0.5		
Catch Depth:	1.4160 ft	Bot Area:	3.9700 sf
Condition:	No particular shape.	Status:	Existing Structure
Approach Credit:	0.6609 ft		

### Node ID: Drop

Desc:	Drop cleanout		
Start El:	65.2500 ft	Max El:	68.6700 ft
Contrib Basin:		Contrib Hyd:	
Hgl Elev:	66.5041 ft		
Struct Type:	CAST METAL INLET	Classification	San Cleanout
Ke Descrip:	CMP: Beveled edges 33.7 or 45 degree bevels; ke=0.2		
Catch Depth:	0.0000 ft	Bot Area:	1.7670 sf
Condition:	Bottom is Formed.	Status:	Proposed Structure
Approach Credit:	0.6609 ft		

### Node ID: CB 42

Desc:	Manhole structure		
Start El:	54.9900 ft	Max El:	68.6700 ft
Contrib Basin:		Contrib Hyd:	
Hgl Elev:	57.1655 ft		
Struct Type:	MH-TYPE 1-48	Classification	San Manhole
Ke Descrip:	CMP: Headwall or Headwall & Wingwall sq edge;.ke=0.5		
Catch Depth:	0.0000 ft	Bot Area:	12.5664 sf
Condition:	No particular shape.	Status:	Proposed Structure
Approach Credit:	0.6609 ft		
Bend Loss:	0.0057 ft	Junction Loss:	0.0276 ft

### Node ID: CB 43

Desc:	Manhole structure		
Start El:	53.9800 ft	Max El:	57.1800 ft
Contrib Basin:		Contrib Hyd:	
Hgl Elev:	56.1677 ft		



Struct Type:	CB-TYPE 2-48	Classification	Catch Basin
Ke Descrip:	CMP: Headwall or Headwall & Wingwall sq edge;.ke=0.5		
Catch Depth:	2.0000 ft	Bot Area:	12.5664 sf
Condition:	No particular shape.	Status:	Proposed Structure
Approach Credit:	0.3518 ft		

#### **Node ID: CB 13046**

Desc:	Manhole structure		
Start El:	53.3300 ft	Max El:	57.1300 ft
Contrib Basin:		Contrib Hyd:	
Hgl Elev:	54.1300 ft		

#### **Node ID: CB 41**

Desc:	Manhole structure		
Start El:	56.5000 ft	Max El:	69.7500 ft
Contrib Basin:		Contrib Hyd:	Site Mit
Hgl Elev:	57.1670 ft		
Struct Type:	CB-TYPE 2-48	Classification	Catch Basin
Ke Descrip:	CMP: Headwall or Headwall & Wingwall sq edge;.ke=0.5		
Catch Depth:	2.0000 ft	Bot Area:	12.5664 sf
Condition:	No particular shape.	Status:	Proposed Structure
Approach Credit:	0.0000 ft		

### **Reaches**

#### **Reach ID: ExCB 1 to 2**

##### **Section Properties:**

Shape:	Circular		Routing Method:	Travel Time Translation
Size	Material	Mannings n	Hyd params By	
15" Diam	Smooth CDEP	0.0120	Mannings Formula	
Length	Slope	Entrance Loss		
168.0000 ft	4.99 %	Square Edge w/Headwall		

Diam			
1.2500 ft			
Up Node	Dn Node	Up Invert	Dn Invert
Ex CB1	Ex CB2	77.7800 ft	69.4002 ft

##### **Conduit Constraints:**

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

##### **Conduit Summary:**

Trib Area	Flow	Capacity	Velocity	Normal Depth
0.1000 ac	8.0059 cf	15.6715 cf	12.8390 ft/s	0.6330 ft
Ent Loss	Exit Loss	Fric Loss	Start TW	
0.330431 ft	0.660862 ft	2.186319 ft	70.9293 ft	

#### **Reach ID: Ex CB2 to drop**

##### **Section Properties:**

Shape:	Circular		Routing Method:	Travel Time Translation
Size	Material	Mannings n	Hyd params By	

15" Diam	Smooth CDEP	0.0120	Mannings Formula		
Length	Slope	Entrance Loss			
85.0000 ft	4.88 %	Groove End Projecting			
Diam					
1.2500 ft					
Up Node	Dn Node	Up Invert	Dn Invert		
Ex CB2	Drop	69.4000 ft	65.2520 ft		
<b>Conduit Constraints:</b>					
Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	
<b>Conduit Summary:</b>					
Trib Area	Flow	Capacity	Velocity	Normal Depth	
0.1000 ac	8.0059 cf	15.5009 cf	12.7339 ft/s	0.6371 ft	
Ent Loss	Exit Loss	Frict Loss	Start TW		
0.132172 ft	0.660862 ft	1.106173 ft	66.5041 ft		

### Reach ID: Drop to CB 42

#### Section Properties:

Shape:	Circular	Routing Method:		Travel Time Translation	
Size	Material	Mannings n	Hyd params By		
15" Diam	Smooth CDEP	0.0120	Mannings Formula		
Length	Slope	Entrance Loss			
10.1000 ft	99.00 %	Square Edge w/Headwall			
Diam					
1.2500 ft					
Up Node	Dn Node	Up Invert	Dn Invert		
Drop	CB 42	65.2500 ft	55.2510 ft		

#### Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

#### Conduit Summary:

Trib Area	Flow	Capacity	Velocity	Normal Depth	
0.1000 ac	8.0059 cf	69.8177 cf	37.8641 ft/s	0.2858 ft	
Ent Loss	Exit Loss	Frict Loss	Start TW		
0.330431 ft	0.660862 ft	0.131439 ft	57.1655 ft		

### Reach ID: CB 42 to 43

#### Section Properties:

Shape:	Circular	Routing Method:		Travel Time Translation	
Size	Material	Mannings n	Hyd params By		
18" Diam	Smooth CDEP	0.0120	Mannings Formula		
Length	Slope	Entrance Loss			
202.0000 ft	0.50 %	Square Edge w/Headwall			
Diam					
1.5000 ft					
Up Node	Dn Node	Up Invert	Dn Invert		
CB 42	CB 43	54.9900 ft	53.9800 ft		

#### Conduit Constraints:

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft

In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller
0.0000 in/hr	NO	NO	YES	NO

**Conduit Summary:**

Trib Area	Flow	Capacity	Velocity	Normal Depth
0.2000 ac	8.4117 cf	8.0683 cf	5.1818 ft/s	1.2963 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.175918 ft	0.351835 ft	1.097512 ft	56.1677 ft	

**Reach ID: CB 43 to TW**

**Section Properties:**

Shape:	Circular		Routing Method:	Travel Time Translation
Size	Material	Mannings n	Hyd params By	
15" Diam	Smooth CDEP	0.0120	Mannings Formula	
Length	Slope	Entrance Loss		
44.0000 ft	1.00 %	Square Edge w/Headwall		
Diam				
1.2500 ft				
Up Node	Dn Node	Up Invert	Dn Invert	
CB 43	CB 13046	53.9800 ft	53.5400 ft	

**Conduit Constraints:**

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

**Conduit Summary:**

Trib Area	Flow	Capacity	Velocity	Normal Depth
0.2000 ac	8.4117 cf	7.0169 cf	1.1988 ft/s	-1.0000 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.364783 ft	0.729566 ft	0.632136 ft	54.7900 ft	
comment:	Hydrograph not shifted, 1.60 min forwarded.Submerged or overtop bank condition.			

**Reach ID: CB 41 to 42**

**Section Properties:**

Shape:	Circular		Routing Method:	Travel Time Translation
Size	Material	Mannings n	Hyd params By	
18" Diam	Smooth CDEP	0.0120	Mannings Formula	
Length	Slope	Entrance Loss		
21.0000 ft	2.38 %	Square Edge w/Headwall		
Diam				
1.5000 ft				
Up Node	Dn Node	Up Invert	Dn Invert	
CB 41	CB 42	46.5000 ft	46.0002 ft	

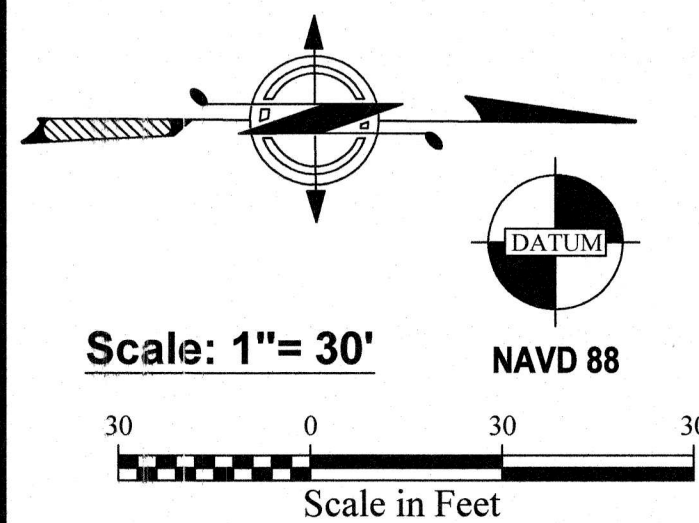
**Conduit Constraints:**

Min Vel	Max Vel	Min Cov	Min Slope	Max Slope	Min drop
2.0000 ft	15.0000 ft	3.0000 ft	0.5000 ft	2.0000 ft	0.0000 ft
In/Exfil	Hold Up	Hold Dn	Match Inv	Allow Smaller	
0.0000 in/hr	NO	NO	YES	NO	

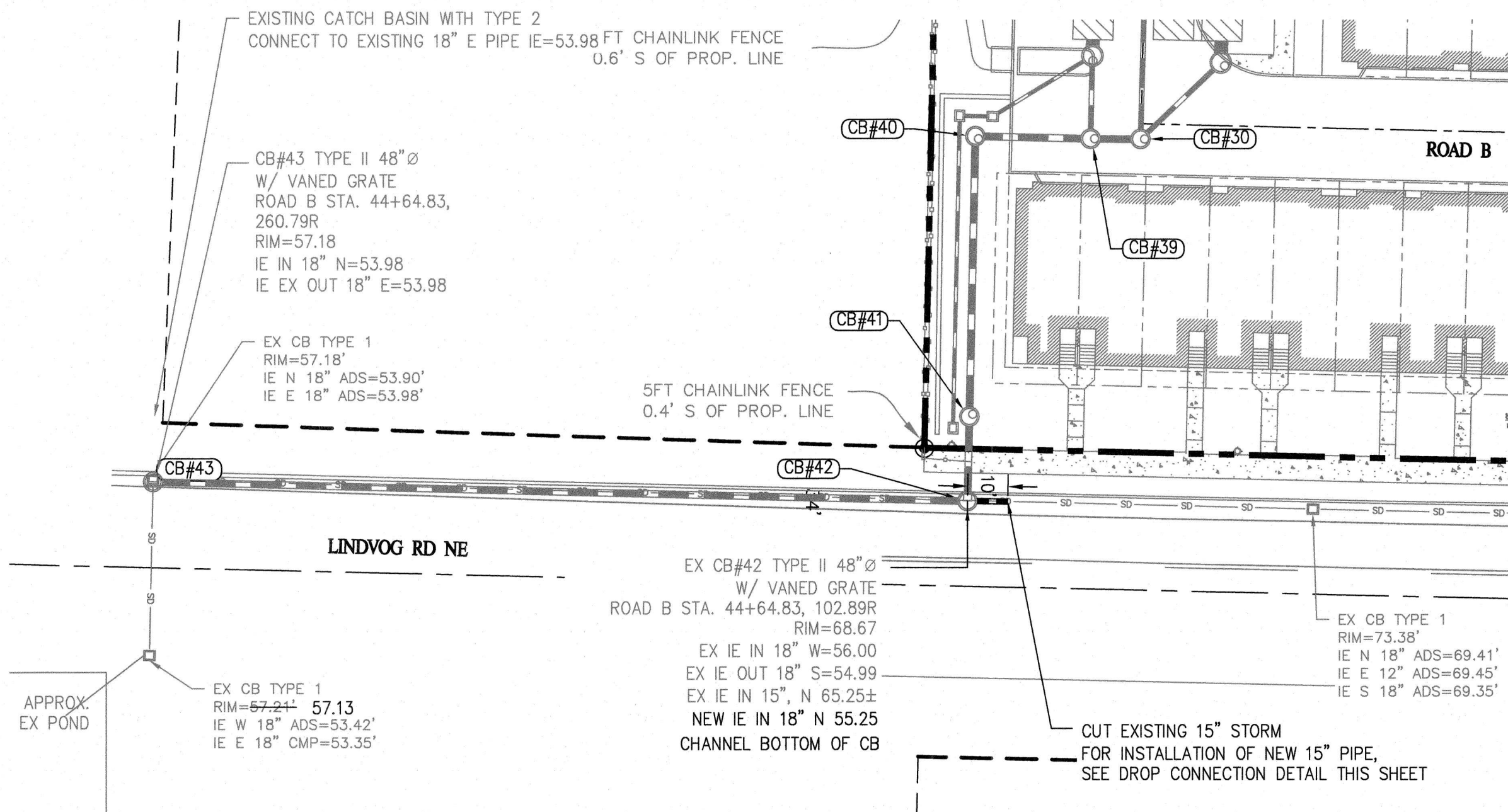
**Conduit Summary:**

Trib Area	Flow	Capacity	Velocity	Normal Depth
0.1000 ac	0.4059 cf	17.6030 cf	4.1163 ft/s	0.1573 ft
Ent Loss	Exit Loss	Frict Loss	Start TW	
0.000410 ft	0.000819 ft	0.000266 ft	57.1655 ft	

## **APPENDIX A - LIST OF FIGURES**

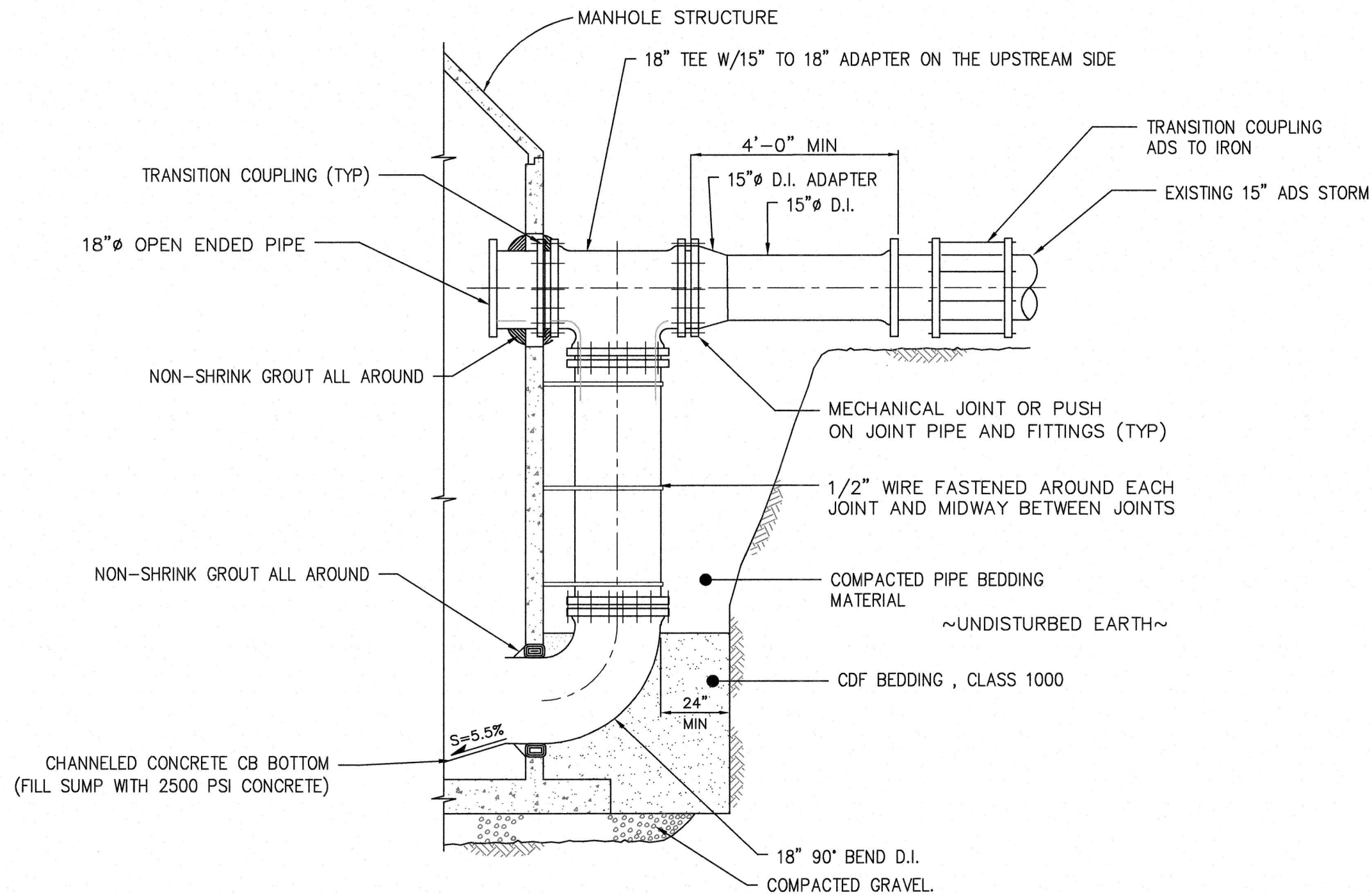


NOTE: SEE SHEET C4.02  
FOR STORM INDEX



DOWNSTREAM OFF-SITE STORM

SCALE 1"=30'



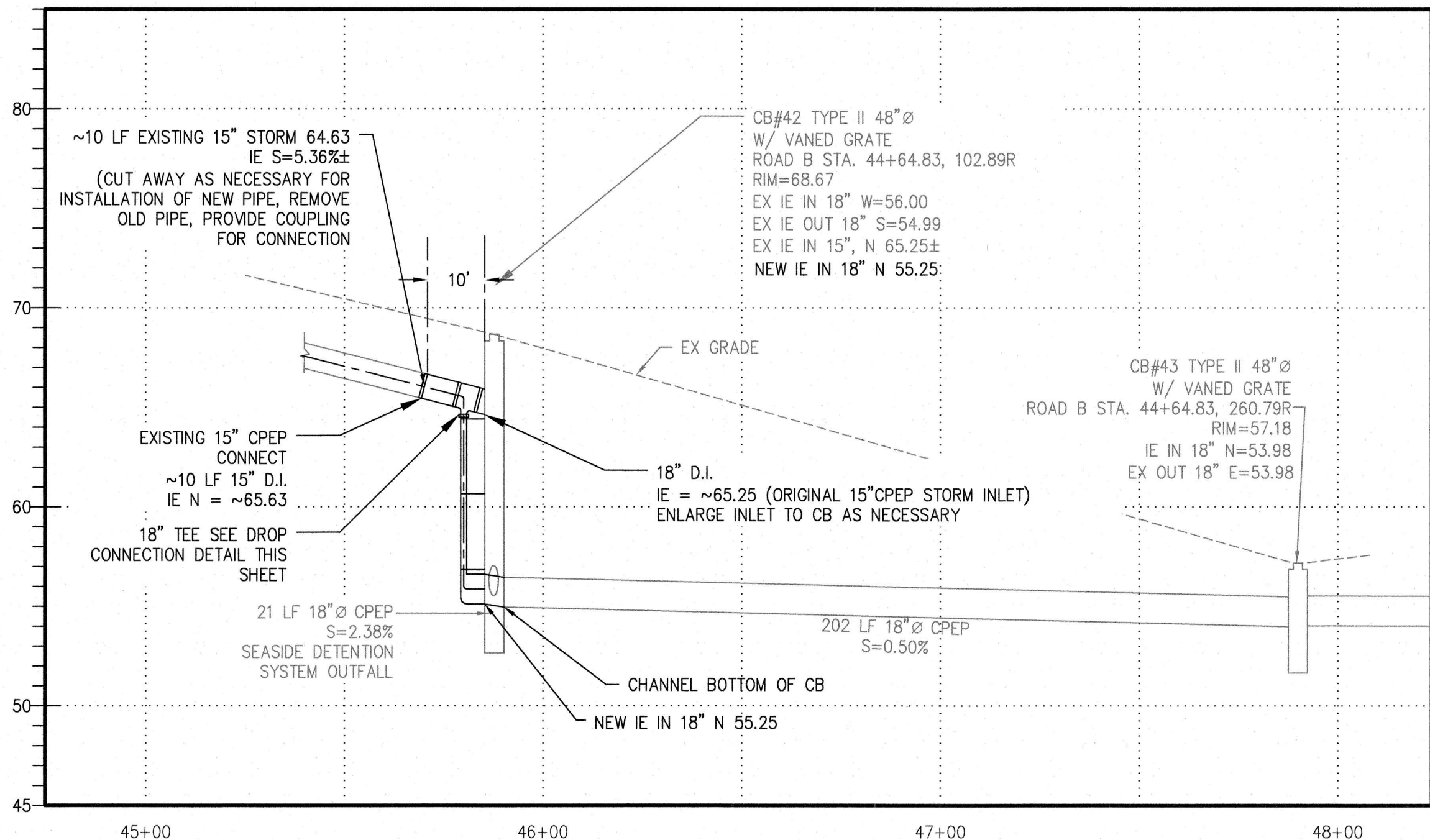
DROP CONNECTION DETAIL

N.T.S.

NOTE

THE APPROXIMATE LOCATION OF EXISTING UNDERGROUND UTILITIES ARE SHOWN ON THE PLANS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE LOCATION OF EXISTING UTILITIES PRIOR TO COMMENCING WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DAMAGES THAT MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO LOCATE, PRESERVE AND PROTECT UNDERGROUND UTILITIES.

CALL 48 HOURS  
BEFORE YOU DIG  
811



STORM PROFILE

(DROP CONNECTION TO CB#43, LINDVOG RD DOWNSTREAM CONNECTION)

SCALE HORIZ: 1"=30'  
VERT.=1"=6'

2020.12.22 AMENDMENT S.D.A.P. 18-02605

DROP CONNECTION PLAN, PROFILE & DETAIL

SEASIDE AT KINGSTON  
SITE DEVELOPMENT ACTIVITY PERMIT - PBD

Portion of the Southeast Quarter Section 26, Township 27 North, Range 2 East  
W.M., in Kitsap County, Washington.

FOR:

Seaside Kingston LLC.

Attn: Joshua Freed  
12900 180th St Suit 220  
Bothel, WA 98011  
(425) 949-8041

FIG 1

SCALE: 1"=30'  
DATE: 2020.12.22  
DRAWING NUMBER:  
9946  
SHEET C4.24

REVISIONS					NO.	DATE	BY	DESCRIPTION	DESIGNED	BY	DATE
1	12/20	RHL	REVISED DOWNSTREAM CONVEYANCE AT CB#42 WITH CONVEYANCE OUTSIDE DROP	DRAWN	RHL	12/20					
				CHECKED	NLOI	12/20					
				APPROVED							
				ACCEPTED							



N.L. Olson & Associates, Inc.  
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